

### Abstract

A phase-locked loop system configured to cause an output signal to tend toward a desired output frequency. The phase-locked loop system includes a charge pump system and an oscillator operatively coupled with the charge pump system. The charge pump system is configured to selectively effect proportional control over the output signal by producing a correcting pulse having a duration and applying the correcting pulse to a proportional control path of the phase-locked loop system. The charge pump system includes a correcting circuit configured to store a correcting charge corresponding to the correcting pulse, and then output the correcting charge over a period of time that is greater than the duration of the correcting pulse.

Other configurations of the phase-locked loop system employ programmable current mirrors, and other structures and methods, to reduce charge pump current within the phase-locked loop.